

# Innovative Processing Methods for the Affordable Manufacture of Multifunctional High Temperature Coatings, Phase I

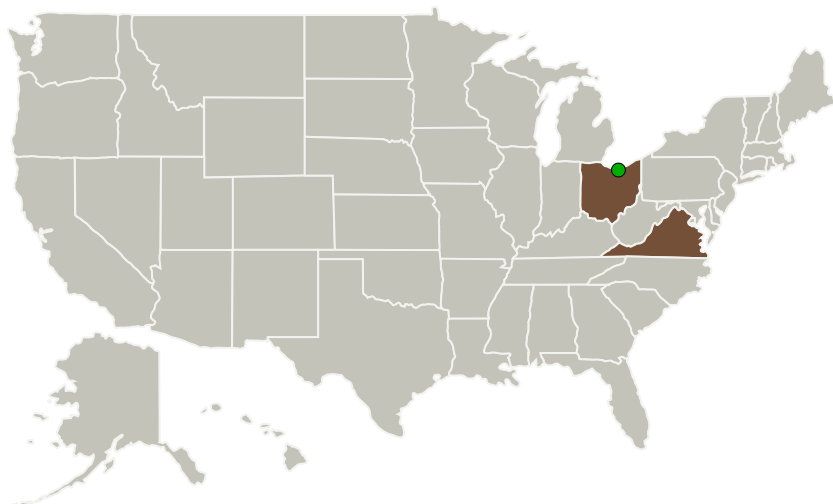
Completed Technology Project (2012 - 2012)



## Project Introduction

Research is proposed to investigate the feasibility of using advanced manufacturing techniques to enable the affordable application of multifunctional high temperature coatings having enhanced resistance to high temperature engine environments. For example, thermal / environmental barrier coatings (T/EBCs) are envisioned to protect the surface of Si-based ceramics against moisture-assisted, oxidation-induced ceramic recession. Current T/EBC systems have been demonstrated in long time exposures at ~2400°F. However, their use at elevated temperatures is limited by the low temperature stability and high diffusion activity of current T/EBC materials. One approach to enhance the temperature capability of these systems is the incorporation of multi-layered T/EBC designs to provide multi-functional protection. In this Phase I effort, novel processing techniques will be developed to enable the affordable, high performance manufacture of such systems using a physical vapor deposition based processing approach which enables enhanced coating adhesion and advanced coating architectural, compositional and microstructural control. Processing developments will then be used to create novel multi-layered coatings. These coating layers will then be incorporated into advanced high temperature capable T/EBC systems in Phase. This work will lead to the incorporation of Si-based ceramic components into enhanced efficiency gas turbine engines to reduce weight and increase operating temperatures. A TRL 4 will be achieved at the end of Phase I and TRL 6 at the end of Phase II.

## Primary U.S. Work Locations and Key Partners



Innovative Processing Methods  
for the Affordable Manufacture  
of Multifunctional High  
Temperature Coatings, Phase I

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Organizations Performing Work	Role	Type	Location
Directed Vapor Technologies International, Inc	Lead Organization	Industry	Charlottesville, Virginia
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

## Project Transitions

**February 2012:** Project Start

**August 2012:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138657>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Directed Vapor Technologies International, Inc

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

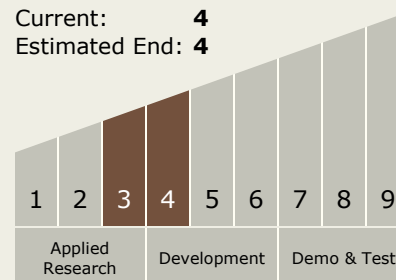
Derek Hass

## Technology Maturity (TRL)

Start: **3**

Current: **4**

Estimated End: **4**



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## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.5 Coatings

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System